

is the "volatile matter". These results for the air-dried sample may be corrected, if desired, to the "sample as received" by taking into account the moistures in the original and in the air-dried sample. In carrying out the poking test as described, the bottom of the crucible is set at a height of 3-6 cm. above the top of a Bunsen flame at least 18 cm. in height. This method is more reliable than the so-called American method, according to which 1 gm. of the sample is heated for 7 min. over the full flame of a Bunsen burner, the bottom of the crucible being 6 to 8 cm. above the top of the burner and the flame 20 cm. high.

**Ultimate Analysis.**—In the case of boiler trials where the "low" or net calorific value is required in order to determine the efficiency, it is necessary to ascertain the amount of hydrogen as well as the water present in the fuel used. For this an "ultimate" analysis of the fuel is made in which the carbon and hydrogen are burned to carbon dioxide and water respectively. The operation is performed according to the method and with the apparatus used by chemists for the general analysis of organic substances. Details will be found in laboratory textbooks on organic chemistry. In view of the general presence of sulphur compounds in commercial fuels, suitable provision must be made for the retention of sulphur dioxide formed in the combustion. The following figures give the results of actual analysis of commercial steam coals and are broadly representative of the types of fuel met with, but in view of what has already been stated regarding the composition of coals generally they should be regarded only as illustrative:

	Welsh Navigation (I).	Welsh Navigation (II).	Scotch Navigation (Shire)	Scotch Navigation (Shire)	Navigation	Japan (Mitsui).	India (Bengal).	West Africa (Udi).
Carbon	88-	85-	84-	82-	81-95	75-62%	73-	63-40%
Hydrogen	4.64	4.79	4.61	5.20	5.24	5.01	6.72	5.01
Oxygen	0.95	1.62	0.00	4.71	2.02	5.16	4.60	10.62
Nitrogen	1.42	1.42	1.50	0.00	1.07	2.54	3.72	1.21
Sulphur	1-30	2-07	0-94	1-28	1-29	(included)	0-39	0-97
Ash	2.18	4.07	5.22	2.40	4.00	0.50	0.91	9.95
Moisture	0-68	0-84	2-13	1-48	1-73	1-18	3-53	9-23
Volatile	100-00	100-00	100-00	100-00	100-00	100-00	100-00	100-00
Fixed	14-	18-	18-	27-	27-	39-92%	37-	34-77%
	97.24	75.72	72.77	69.52	66.54	40.21	40.52	45.07

B.Th.U.nerl Specific	15.104 1-336	1-324	14.047 1-350	14.450 1-303	14.000 1-316	12.006 ~~	12.014 1-329	~.050 1-372
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**Prepared Coals.**—To suit the requirements of the market and at the same time to eliminate a portion of the non-combustible matter, coal as mined is frequently subjected to a process of grading with or without the accompaniment of washing. The products, in addition to round coal, are treble, double, and single nuts, peas and pearls, and dross. The tendency is for the treble and double nuts to show a reduction of ash as compared with